L 10123-63

ACCESSION NR: AP3001320 0

Oxidizability was evaluated from the isotherms of oxygen absorption, the nature and quantity of oxidation products, and the amount of sediment formed. Oxidizability was shown to depend primarily upon the concentration and type of organosulfur compounds present. These compounds oxidize more readily than hydrocarbons and when present in small quantities inhibit the oxidation of hydrocarbons by decomposing peroxides formed in hydrocarbon media. In larger quantities the organosulfur compounds are oxidized by oxygen as well, and thus accelerate oxidation of the oil. Oxidation of S-containing oils results in the formation of sulfonic and carboxylic acids. When S content is sufficiently high, the concentration of these acids is a linear function of the total S content. A parabolic dependence was established between the amount of sediment formed as a result of the oxidation of S-containing oils and the total S content. A formula for calculating the amount of sediment formed was derived and verified experimentally. Oils containing about 0.45% S are most resistant to oxidation and form the smallest quantity of oxidation products and sediment. Orig. art. has: 6 figures and 1 formulas.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 28May63 ENCL: 00

SUB CODE: 00 NO REF SOV: 009 OTHER: 002

Card 2/2

KREYN, S.E.; RUBINSHTEYN, I.A.; POPOVA, Ye.A.

Effect of chemical composition of oils on their stability during oxidation. Neftekhimiia 3 no.4:584-593 Jl-Ag '63. (MIRA 16:11)

KREYN, S.E.; VIPPER, A.B.; SHEKHTER, Yu.N.

Solubilization of the contamination products of motor oils by the cleaning action of metal sulfonates. Khim.i tekh.topl.i masel 8 no.11:52-57 N '63. (MIRA 16:12)

GOL'DBERG, D.O.; KREYN, S.E.; KALAYTAN, Ye.N.; KICHKIN, G.I.; MINKHAYROVA, S.A.; TRUBENKOVA, N.N

Methods for obtaining oils with improved low-temperature properties from sour curde. Trudy BashNII NP no.6:105-111 '63. (MIRA 17:5)

KULIYEV, Ali Musayevich, prof.; KREYN, S.E., prof., doktor tekhn. nauk, red.; YENISHERLOVA, O.M., red.

[Lubrication oil additives; chemistry and technology] Prisadki k smazochnym maslam; khimiia i tekhnologiia. Moskva, Khimiia, 1964. 321 p. (MIRA 18:3)

L 14574-66 EWT(m)/T DJ

ACC NR: AP6005236 SOURCE CODE: UR/0413/66/000/001/0074/0074

INVENTOR: Papok, K. K.; Kreyn, S. E.; Vipper, A. B.; Zuseva, B. S.; Garzanov, G. Ye.; Vinner, G. G.; Dobkin, I. Ye.; Afanas'yev, I. D.; Rogachevskaya, T. A.; Somov, V. A.; Botkin, P. P.; Kuliyev, A. M.; Zeynalova, G. A.

ORG: none

TITLE: Preparation of motor oil. Class 23, No. 177579

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 1, 1966, 74

TOPIC TAGS: motor oil, antiwear additive, detergent additive

ABSTRACT: An Author Certificate has been issued for a preparative method for motor oil, involving addition of a detergent and an antiwear additive to the oil base. The method provides for the use of an alkyl-formaldehyde condensation product and of a dialkyl dithiophosphate based on C_{12}-C_{16} alcohols as the additives. [BO]

SUB CODE: 11/ SUBM DATE: 16Apr64/ ATD PRESS: 4190

FW

Card 1/1 UDC: 621.892.8

L 45678-66 EWT(m)/T DJ/WE

ACC NR: AP6023624 SOURCE CODE: UR/0318/66/000/004/0021/0024

AUTHOR: Botkin, P. P.; Vipper, A. B.; Zuseva, B. S.; Kreyn, S. E.; Papok, K. K.; Somov, V. A.

52
B

ORG: none

TITLE: New composition of diesel oil additives

SOURCE: Neftepererabotka i neftekhimiya, no. 4, 1966, 21-24

TOPIC TAGS: diesel oil, antioxidant additive, lubricant additive

ABSTRACT: A composition of additives to motor fuels was developed in order to match imported additives in their effectiveness when taken in similar concentrations. The composition includes the additives BFK (4%) and LANI-317 (0.25%). The BFK additive is the barium salt of the products of condensation of alkylphenol with formaldehyde, and the LANI-317 additive is zinc dialkyldithiophosphate in isopropyl alcohol and C_{12}-C_{16} alcohols. In wetting and antioxidation properties, the new composition is practically equivalent to foreign additives (those of the Monsanto Co.) designed for oils of the first series of the international classification. The new composition also has advantages over antiwear and wetting agents in the operation of a diesel motor on low-sulfur fuel. The use of the new composition of additives increases the motor potential of fast diesel engines and reduces their oil consumption. Orig. art.

Card 1/2 UDC: 665.4:66.022.3:621.892

L 45676-66

ACC NR: AP6023624

has: 3 tables.

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 007/ OTH REF: 001

Card 2/2 fv

ACC NR: AP6023960 SOURCE CODE: UR/0204/66/006/002/0241/0248

AUTHOR: Kreyn, S. E.; Rubinshteyn, I. A.; Popova, Ye. A.

ORG: none

TITLE: Antioxidant properties of organic sulfur compounds present in petroleum oils, and possible formation of aryl sulfide complexes

SOURCE: Neftekhimiya, v. 6, no. 2, 1966, 241-248

TOPIC TAGS: organic sulfur compound, antioxidant additive

ABSTRACT: The paper discusses the antioxidant properties of organic sulfur compounds contained in narrow chromatographic fractions isolated form the sulfur aromatic concentrate of the Tuymazy petroleum distillate with $\nu_{100°}$ = 10 centistokes. The antioxidant properties of the compounds were found to increase with the degree of their cyclic character; their inhibiting capacity considerably exceeds that of the hydrocarbons with which they are associated. The various organic sulfur compounds present in the distillate differ in the mechanism of their action and manifest their maximum effectiveness at certain definite concentrations in the oil which are characteristic of each group. The organic sulfur inhibitors may form associates with aromatic hydrocarbons and organic sulfur compounds whose molecules contain aromatic polynuclei. The formation of associates decreases the antioxidant effect of organic sulfur and aromatic inhibitors. Orig. art. has: 2 figures and 5 tables.

Card 1/2 UDC: 665.521.5:665.547.7.094.38

L 45836-66

ACC NR: AP6023960

SUB CODE: 11/ SUBM DATE: 23Aug65/ ORIG REF: 006/ OTH REF: 001

Card 2/2 LC

L 01303-67 EWT(m)/EWP(j)/EWP(t)/ETI IJP(c) JD/WB/RM

ACC NR: AP6003433 (A) SOURCE CODE: UR/0065/66/000/001/0043/0051

AUTHOR: Dol'berg, A. L.; Vaynshtok, V. V.; Kreyn, S. E.; Shekhter, Yu. N.; Poddubnyy, V. N.

ORG: none

TITLE: Production of nitrated petrolatum-base corrosion inhibitors

SOURCE: Khimiya i tekhnologiya topliv i masel, no.1, 1966, 48-51

TOPIC TAGS: petroleum product, corrosion inhibitor, steel, corrosion protection

ABSTRACT: Ozocerite and petrolatum-base corrosion inhibitors are now made by oxidation with air at 130-160C in the presence of a catalyst. The preparation takes 10-24 hr. A less time-consuming method was offered for producing a corrosion inhibitor from petrolatum. It consisted of treating petrolatum with a 62% HNO_3 solution, neutralizing the reaction product with a 20% aqueous solution of NaOH without removal of the spent HNO_3, and dehydration. The nitrated and neutralized petrolatum was completely soluble in oil and insoluble in water. The test on the corrosion-protective properties of the 5% solution of nitrated petrolatum in transformer oil made with St.45 steel proved that, as a corrosion inhibitor, the product was not inferior, if not superior, to the oxidized petrolatum. The optimal consumption of HNO_3 was determined as 10%. Nitrating petrolatum with large amounts of HNO_3 ($\geq$30%) contributed in some cases to its corrosive properties

Card 1/2 UDC: 665.521.5 : 66.095.81 : 620.193

L ...

ACC NR: AP6003433

with respect to the steel. The treatment of oxidized petrolatum with small amounts (5-15%) of 62% HNO_3 with neutralization by NaOH and dehydration yielded an inhibitor soluble both in water and in oils. This permitted it to be used in the form of either oil or water solutions. The most effective corrosion inhibitors for the steel was the oxidized petrolatum, having an acid number of 30-45 after treatment with 15% addition of the 62% HNO_3 solution. The quality of the inhibitors depended greatly on the purity of the final product. For this purpose the nitrated oxidized petrolatum was purified of spent HNO_3 by settling and treated with NaOH to a neutral reaction. The product of nitration of oxidized petrolatum was tested as a corrosion inhibitor for ferrous and nonferrous metals (Al, duralumin, Cu, Pb, Sn, bronze, Mg alloys, steels, solder, cast iron, and in combinations of metal-wood and metal-rubber). In all cases it provided for long-lasting and reliable protection. The nitration of oxidized petrolatum from the Kazan NPZ was made in a pilot plant installation with 62% HNO_3 (consumption 15%) at 70-90C for 4 hr without settling out any of the spent HNO_3. The nitrated product had an acid number of 90 mg KOH. The final neutralized inhibitor had an ash content of 7.5%, an alkalinity by phenolphthalein of 1.2 mg KOH and by bromophenol blue of 65.7 mg KOH, a water content of 1.6% Dean and Stark, and good protective properties of the 5% solution in transformer oil for St.45 steel: more than 30 days in water before the appearance of corrosion nuclei. The nitrated petrolatum and the nitration of oxidized petrolatum can be made in the same simple apparatus which is used for the nitration of mineral oils. Orig. art. has: 5 tables.

SUB CODE: 11,13/ SUBM DATE: none/ ORIG REF: 006/ OTH REF: 002

Card 2/2

L 42173-66 EWT(m)/T DJ

ACC NR: AR6014532 (A) SOURCE CODE: UR/0081/65/000/019/P018/P018

AUTHORS: Badyshtova, K. M.; Vipper, A. B.; Vorozhikhina, V. I.; Denisenko, K. K.; Kreyn, S. E.; Pyatiletova, N. I.; Ryazanov, L. S.; Yastrebov, G. I. 31

TITLE: Effect of the extent of refining of the distillate and residual components of DS-14 oil from sulfurous petroleum upon their operational properties B

SOURCE: Ref. zh. Khimiya, Abs. 19P129

REF SOURCE: Tr. Kuybyshevsk. n.-i. in-t neft. prom-sti, vyp. 25, 1964, 85-95

TOPIC TAGS: lubricating oil, petroleum refining, phenol / DS-14 lubricating oil, MS-20 lubricating oil, DS-11 lubricating oil

ABSTRACT: Laboratory study and testing on the engine YaAZ-204 of five samples of DS-14 oil of Novokuybyshev NPZ (differing by the technology of their processing) have been performed. The study shows that the changes in the extent of phenolic refining of distillate and residual components (within the limits of 160—180 and 250—320% of phenol, respectively) have no effect on the detergency, antioxidative, and anti-wear properties of DS-14 oil containing effective additives. Economically, the most convenient method for producing DS-14 oil is to mix the residual and distillate components of Diesel oil, 60 and 40%, respectively, (i.e., components treated to a less extensive phenolic refining). This leads to lowering the price of DS-14 oil by 15% and to increasing its yield by 4%, as compared with the production of DS-14 oil by mixing oils MS-20 and DS-11. A. N. [Translation of abstract]

SUB CODE: 11

Card 1/1

KREYN, Selim G.

"On an Inner Characteristic of the Set of All Continuous Functions Defined on a Bicompact Hausdorff Space," Dokl. AN SSSR, 27, No.5, 1940

Odessa State U., Kiev

KREYN, S. G.

"Semi-Arranged Rings," Dokl. AN SSSR, 30, No.8, 1941

Kiev State U., Math. Inst. Ukr SSR Acad Sci

KREYN, S.G.

3

Kreyn, S. G. The behaviour of gasodynamic factors near the front of a striking wave. Rep. [Dopovidi] Acad. Sci. Ukrainian SSR no. 3-4, 11-16 (1946). (Ukrainian and English)

The author writes down the one-dimensional equations governing the transition of pressure, density and velocity across a normal shock wave ["striking wave" as mistranslated here] propagated into undisturbed gas. These quantities, taken just behind the shock, increase if the velocity D of propagation of the wave increases, as indeed is evident from inspection. The author then goes on to examine the signs of the gradients of these quantities just behind the shock. Owing to some oversight the signs are actually the reverse of these given. *D. P. Ling* (Murray Hill, N. J.).

Source: Mathematical Reviews, Vol 8 No. 7

KREYN, S. G.

Krasnosel'skii, M., and Krein, S. On the center of a general dynamical system. Doklady Akad. Nauk SSSR (N.S.) 58, 9–11 (1947). (Russian)

G. D. Birkhoff has shown [cf. Dynamical Systems, Amer. Math. Soc. Colloquium Publ., v. 9, New York, 1927, p. 196] that for an ordinary dynamical system (a one-parameter transformation group) the relative sojourn of an arbitrary point of the phase space in a neighborhood of the center is 1. The present paper extends this result to a more general transformation group.

Let G be a connected locally compact multiplicative topological group with identity e. Suppose also that G is not compact. Let M be a compact metric space and let G act as a transformation group on M; that is to say, to $g \epsilon G$ and $x \epsilon M$ there is assigned $g(x) \epsilon M$ such that (1) $e(x)=x$ $(x \epsilon M)$; (2) $g'(g(x))=(g'g)(x)$ $(g', g \epsilon G; x \epsilon M)$; (3) the function $g(x)$ maps $G \times M$ continuously into M. A point $x \epsilon M$ is said to be nonwandering provided that to each neighborhood U of x and each compact set Q in G there corresponds $g \epsilon G-Q$ such that $U \cap g(U) \neq 0$. Let M_1 be the set of nonwandering points of M. The authors remark that if V is a neighborhood of M_1 and if $x \epsilon M$, then there exists a compact set Q in G such that $g(x) \epsilon V$ for all $g \epsilon G-Q$. [Cf. Birkhoff, loc. cit., p. 193.] For $x \epsilon M$, $N \subset M$ and $H \subset G$ let $\{x, N; H\}$ denote the set of all $g \epsilon H$ for which $g(x) \epsilon N$. Let m be a right invariant Haar measure in G. It is pointed out that, if V is an open neighborhood of M_1, then $m\{x, M-V; G\}$ is bounded uniformly for $x \epsilon M$. [Cf. Birkhoff, loc. cit., p. 193.] Define a transfinite sequence $M \supset M_1 \supset \cdots \supset M_\alpha \supset M_{\alpha+1} \supset \cdots$ of nonvacuous closed invariant sets in M as follows: $M_{\alpha+1}$ is the set of nonwandering points relative to the space M_α; $M_\alpha = \cap_{\beta<\alpha} M_\beta$ in case α is a limit ordinal. The smallest set Z in this sequence is called the center. The following theorem is proved. If V is an open neighborhood in M of the center Z and if W is an open neighborhood of e in G such that $\bar{W}$ is compact, then [illegible] $= 1$ uniformly for $x \epsilon M$.

W. H. Gottschalk (Princeton, N. J.).

Source: Mathematical Reviews, 1948, Vol. 9, No. 5

KREYN, S.G.

Krein, S., and Levin, B. On a problem of I. P. Natanson. Uspehi Matem. Nauk (N.S.) 3, no. 3(25), 183–186 (1948). (Russian)

Let $K(h, x)$ and $S(h, x)$ be two kernels defined and continuous for $0<x\leqq h\leqq 1$. The authors discuss the problem of conditions under which

$$(*) \qquad \lim_{h\to 0}\int_0^h K(h, x)f(x)dx$$

implies

$$(\ddagger) \qquad \lim_{h\to 0}\int_0^h S(h, x)f(x)dx,$$

where $f(x)$ is integrable over $(0, 1)$. They show that, if the partial derivatives $K_x'(h, x)$ and $S_x'(h, x)$ exist and are continuous for $0<x\leqq h\leqq 1$, if $K(h, h)=S(h, h)\neq 0$ and if

$$\int_0^h |S_x'(h, x)/S(x, x)|dx<N,$$

$$\int_0^h |K_x'(h, x)/K(x, x)|dx\leqq q<1,$$

where N and q are independent of h, then $(*)$ implies $(\ddagger)$. The special case $K(h, x)=2h/(x^2+h^2)$, $S(h, x)=1/h$ was proposed as a problem by Natanson.

A. Zygmund.

Source: Mathematical Reviews, Vol 10 No. 2

KREYN S.G.

BOGOLYUBOV, M.M.; KREYN, S.G.

Positive, totally continuous operators. Zbir.prats' Inst.mat. AN URSR no.9:130-139 '48. (MLRA 9:9)
(Operators (Mathematics)) (Spaces, Generalized)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

KATS, G.I.; KREYN, S.G.

Limit center of a dynamic system. Zbir.prats' Inst.mat.AN URSR no.11:121-124 '48. (MLRA 9:9)
(Dynamics) (Aggregates)

KREYN, S.G.

Krein, S. G., and Levin, B. Ya. On the convergence of singular integrals. Doklady Akad. Nauk SSSR (N.S.) 60, 13–16 (1948). (Russian)

A singular integral is $\int_a^b \varphi_n(x, t)f(t)dt$, where the kernels satisfy (*) $\lim_{n\to\infty} \int_\alpha^\beta \varphi_n(x, t)dt = 1$ for $a \leqq \alpha < x \leqq \beta < b$. Generalizing the classical problem of representation by singular integrals, the authors seek necessary and sufficient conditions on the φ_n so that for all functions $f(x)$ of a specified class (**) $\lim_{n\to\infty} \int_a^b \varphi_n(x, t)f(t)dt = f(x)$ will hold at all points x for which $\lim_{r\to 1} \int_a^b \Theta_r(x, t)f(t)dt = f(x)$, Θ_r $(r<1)$ being a given one-parameter family of kernels. This problem is treated in a very general setting using Banach space methods. The following is one of the theorems obtained by specializing the general results. Let φ_n, $n \geqq 1$, be such that $\int_a^b \varphi(t)f(t)dt$ exists for every $f(t) \epsilon L^p$ which at the point $t = x$ is the derivative of its indefinite integral. Then necessary and sufficient conditions that (**) hold for all $f(t) \epsilon L^p$, $p \geqq 1$, at points $t = x$ where $f(t)$ is the derivative of its indefinite integral are (*) and $\|\varphi_n(x, t)\| \leqq M(x)$ with M independent of n. Here $\|\varphi\| = \min\,(\max(\|\chi\|_{L^q}, V[\psi]))$, where $q = p/(1-p)$,

$$V[\psi] = \int_a^x \operatorname*{var}_{a \leq t \leq u} \psi(t)du + \int_x^b \operatorname*{var}_{u \leq t \leq b} \psi(t)du$$

and min refers to all decompositions $\varphi(t) = \psi(t) + \chi(t)$ with $\chi(t) \epsilon L^q$ (there exist such with finite $V[\psi]$). This theorem extends and completes results of Lebesgue [Ann. Fac. Sci. Univ. Toulouse (3) 1, 25–117, 119–128 (1909)] and P. Romanovski [Math. Z. 34, 35–43 (1931)] for the case $p = 1$.

A. Dvoretzky (Princeton, N. J.).

Source: Mathematical Reviews, Vol 10, No. 1

~~KREYN, S.G.~~ KREYN, S.G.

4
0
0
0

Krein, S. G., and Levin, B. Ya. On the strong representation of functions by singular integrals. Doklady Akad. Nauk SSSR (N.S.) 60, 195–198 (1948). (Russian)

[Cf. the preceding review.] The function $f(x)$ is said to be strongly represented at the point x by the singular integral with kernels φ_n if (†) $\lim_{n\to\infty} \int_a^b \varphi_n(x, t)|f(t)-f(x)| = 0$. The problem of this paper is to obtain necessary and sufficient conditions on the φ_n so that (†) will be implied by $\lim_{r\to 1} \int_a^b \Theta_r(x, t)|f(t)-f(x)|dt = 0$, where Θ_r, $(0<r<1)$ is a given one-parameter family of nonnegative kernels. Using the methods of the paper reviewed above and results of M. Krein [C. R. (Doklady) Acad. Sci. URSS (N.S.) 28, 13–17 (1940); these Rev. 2, 315] on cones in Banach space, the authors obtain several results on the type of functional they are interested in, including necessary and sufficient conditions for the weak convergence to zero of certain sequences of linear functionals. Their general theorems contain as a special case the results of D. Faddeeff [Rec. Math. [Mat. Sbornik] N.S. 1(43), 351–368 (1936)] and B. I. Korenblyum [same Doklady 58, 973–976 (1947); these Rev. 9, 347] on the representation by singular integrals of functions of L^p, $p \geq 1$, at their Lebesgue points.

A. Dvoretzky (Princeton, N. J.).

Source: Mathematical Reviews, Vol 10, No. 1

KREYN, S. G.

Korenblyum, B. I., Krein, S. G., and Levin, B. Ya. On certain nonlinear questions of the theory of singular integrals. Doklady Akad. Nauk SSSR (N.S.) 62, 17–20 (1948). (Russian)

Let E be a separable Banach space, and $\bar{E}$ the space conjugate to E. Let $C([0, 1]; E)$ denote the space of all functions $\bar{f} = f_r$ $(0 \leq r \leq 1)$, having values in E, and strongly continuous on the segment $[0, 1]$. The norm $\|\bar{f}\|$ is defined as $\max_{0 \leq r \leq 1} \|f_r\|$. (1) Modifying the result of Gowurin [Fund. Math. 27, 254–268 (1936)] the authors state that every linear functional in $C([0, 1]; E)$ is representable in the form (*) $F(\bar{f}) = \int_0^1 \varphi_r(f_r) d\sigma(r)$, where $\sigma(r)$ is nondecreasing in $[0, 1]$ and φ_r a B-measurable abstract function with values in $\bar{E}$, satisfying $\|\varphi_r\| = 1$ $(0 \leq r \leq 1)$. Conversely every expression (*) is a linear functional in $C([0, 1]; E)$ with norm $\|F\| = \operatorname{var}_{0 \leq r \leq 1} \sigma(r)$. The representation (*) is unique except for the normalization of $\sigma(r)$ and the values of φ_r on a set of measure 0 with respect to $\sigma(r)$. (2) Let L_0^p $(p > 1)$ be the space of all functions $f(x) \in L^p(0, 1)$ satisfying $\lim_{h \to 0} h^{-1} \int_0^h |f(x)|^p dx = 0$, the norm $\|f\|_0^p$ being defined as $\max_{0 < h \leq 1} [h^{-1} \int_0^h |f(x)|^p dx]^{1/p}$. Then the general linear functional in L_0^p is of the form (‡) $F(f) = \int_0^1 F(x) f(x) dx$, where the function $F(x)$ has the following property: the maximal convex function $\Phi(x)$ majorized on $(0, 1)$ by $\int_x^1 |F(t)|^q dt$ $(p^{-1} + q^{-1} = 1)$ satisfies $\int_0^1 [-\Phi'(x)]^{1/q} dx < \infty$. Conversely every $F(x)$ having this property generates a functional (‡) with norm $\|F\| = \int_0^1 [-\Phi'(x)]^{1/q} dx$. This is obtained as a special case of a general result concerning functionals associated with kernels $K(x, t)$ defined in the square $0 \leq x, t \leq 1$. Results of similar type are obtained for sequences of functionals.

A. Zygmund (Chicago, Ill.).

Source: Mathematical Reviews, Vol. 10 No.

2/

KREYN, S.G.

KRASNOSEL'SKIY, M.A.; KREYN, S.G.

Proof of the category theorem for a projective space. Ukr.mat.zhur. [1] no.2:99-102 '49. (MLRA 7:10)
(Topology)

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

KREYN, S. G.

4000

Daleckiĭ, Yu. L., and Kreĭn, S. G. On differential equations in Hilbert space. Ukrain. Mat. Žurnal 2, no. 4, 71-91 (1950). (Russian)

The equations considered are of the forms:

(a) $$d\Phi/dt = H(t)\Phi(t),$$

with Φ a variable operator in a Hilbert space, with given initial values; (b) $dq/dt = H(t)q + p(t)$ (in these H is a variable bounded operator, q, p vectors, and in case (b) upper estimates for $\|q\|$ are found when H and p are slowly varying); (c) $Adq/dt = iBq + pe^{i\theta}$, where $A = \sum \epsilon^k A_k(\epsilon t)$, $B = \sum \epsilon^k B_k(\epsilon t)$, $p = \sum \epsilon^k p_k(\epsilon, t)$, $d\theta/dt = k(\epsilon t)$. In case (c) a series expansion asymptotic to the solution is studied; the character of the solution depends on whether $k(t)$ lies in the spectrum of $A^{-1}B$. The operators A_k, B_k are hermitian, A_0 positive bounded with bounded inverse, and other conditions are laid down. Second order equations of a type similar to (c) are studied by reducing them to the case (c).

J. L. B. Cooper (Cardiff).

Source: Mathematical Reviews, Vol 13 No. 10

DALETS'KIY, Yu.L.; KREYN, S.G.

Some properties of operators depending on the parameter. Dop. AN URSR no.6:433-436 '50. (MLRA 9:8)

1. Institut matematiki Akademii nauk Ukrains'koi RSR. Predstaviv diysniy chlen Akademii nauk Ukrains'koi RSR B.V. Gnedenko.
(Operators (Mathematics)) (Spaces, Generalized)

KREYN, S.G.

Berezanskii, Yu. M., and Krein, S. G. Continuous algebras. Doklady Akad. Nauk SSSR (N.S.) 72, 5-8 (1950). (Russian)

Par une "algèbre continue," les auteurs entendent ce qui suit: c'est une algèbre associative et commutative sur le corps complexe, dont les éléments peuvent être identifiés aux fonctions complexes continues définies sur un espace topologique compact Q (qui joue le rôle d'une "base" de l'algèbre), et ce de telle sorte que, si l'on note $f{\cdot}g$ la multiplication dans l'algèbre, on ait une formule du type $f{\cdot}g(x)=\iint_{Q\times Q}f(y)g(z)dC_x(y,z)$; dans cette formule, C_x désigne une mesure de Radon sur $Q\times Q$, qui est positive et dépend continûment du point $x\epsilon Q$. En fait, la définition donnée par les auteurs n'est pas aussi simple que ce qui précède, car ils parlent uniquement de fonctions d'ensemble; mais l'équivalence des deux définitions se voit immédiatement. Étant donnée une algèbre continue de base Q, les auteurs appellent mesure multiplicative toute mesure positive m sur Q telle que l'on ait $m(f{\cdot}g)=m(f)m(g)$ pour f, g continues sur Q (ici encore la définition des auteurs est en apparence différente); par une application ingénieuse d'un théorème de M. Krein sur les opérateurs conservant un cône, les auteurs prouvent qu'il existe toujours de telles mesures (non nulles!) (le fait que les mesures C_x sont positives semble essentiel pour la démonstration); en outre, deux telles mesures sont toujours absolument continues l'une par rapport à l'autre, au moins si, pour tout $x\epsilon Q$ il existe f, g avec $f{\cdot}g(x)\neq 0$.

Soit dx une mesure multiplicative; la multiplication $f{\cdot}g$ est alors prolongeable par continuité à l'espace L^1 construit sur dx, d'où une algèbre normée complète et commutative. Une fonction $\chi(x)$, mesurable et bornée pour dx, est dite un caractère si la formule $f\rightarrow\int f(x)\chi(x)dx$ définit un homomorphisme de l'algèbre L^1 sur le corps des nombres complexes; ces caractères sont évidemment en correspondance avec les idéaux maximaux de l'algèbre déduite de L^1 par adjonction d'un élément unité; il peut du reste arriver qu'il n'existe pas de caractère non trivial (autrement dit, l'algèbre L^1 peut être identique à son radical). Les auteurs donnent finalement trois exemples d'algèbres continues; le premier est évidemment celui des groupes compacts abéliens; le second est relatif à $Q=(-1,+1)$ et a pour caractères les polynomes de Legendre; le troisième, analogue, conduit aux polynomes de Tchebicheff. Il est à remarquer que, dans ces deux derniers exemples, les auteurs définissent directement $f{\cdot}g$, autrement dit, utilisent la définition que nous avons donnée au début, au lieu de la leur. Bien entendu, et comme les auteurs le font eux-mêmes observer, les notions introduites ici sont en relation étroite avec la théorie des "systèmes de translations généralisées" de Levitan. Par ailleurs, il serait souhaitable de généraliser leur théorie au cas des espaces localement compacts, et de se libérer de l'hypothèse que les C_x sont positives; on pourrait alors inclure dans la théorie les "fonctions sphériques" de Gelfand, par exemple.

R. Godement (Nancy).

Source: Mathematical Reviews, Vol 12, No. 3.

Inst. Math. AS USSR

KREYN, S.G.

Mat (2)

5-21-54
mef

Mathematical Reviews
Vol. 14 No. 10
Nov. 1953
Algebra

Berezanskii, Yu. M., and Krein, S. G. Hypercomplex systems with a compact basis. Ukrain. Mat. Zurnal 3, 184-204 (1951). (Russian).

Detailed exposition of results already announced [Doklady Akad. Nauk SSSR (N.S.) 72, 5-8, 237-240 (1950); these Rev. 12, 188, 189]. The authors have changed the term "continuous algebra" to the one given in the title.

I. Kaplansky (Chicago, Ill.).

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00082642０

KREYN, S. G.

Daleckiĭ, Yu. L., and Krein, S. G. Formulas of differentiation according to a parameter of functions of Hermitian operators. Doklady Akad. Nauk SSSR (N.S.) 76, 13-16 (1951). (Russian)

For each value of τ in (a, b) let $H(\tau)$ be a bounded Hermitian operator in Hilbert space. It is stated that if $f(\lambda)$ is a function of the real variable λ with an absolutely continuous derivative $df/d\lambda$ in some neighbourhood of the spectrum of $H(\tau_0)$, and $E_\lambda(\tau_0)$ is the spectral set of $H(\tau_0)$, then

$$\frac{df(H(\tau_0))}{d\tau}=\int\int\frac{f(\lambda)-f(\mu)}{\lambda-\mu}dE_\lambda(\tau_0)\frac{dH(\tau_0)}{d\tau}dE_\mu(\tau_0),$$

where the integral is interpreted as an abstract repeated Stieltjes integral. Analogous formulae are given for derivatives of the form $df(H(\tau_0), \tau)/d\tau$ and for higher order derivatives of $f(H(\tau))$. The latter are applied to give the expansion of $f(H_1+\epsilon H_2)$ in powers of ϵ. Further applications are to solution of the equation $H(\tau)x(\tau)=g(\tau)$, for the unknown element $x(\tau)$ of the space, and of the equation $H(\tau)X(\tau)-X(\tau)H(\tau)=F(\tau)$ for the unknown operator $X(\tau)$.

J. L. B. Cooper (Cardiff).

Source: Mathematical Reviews, Vol 12 No. 6

USSR/Mathematics - Iteration Process, Approximation   Jul/Aug 52

"Note on the Distribution of Errors During the Solution of a System of Linear Equations by an Iteration Process," M. A. Krasnosel'skiy, S. G. Kreyn

"Uspekh Matemat Nauk" Vol VII, No 4 (50), pp 157-161

The purpose of the present note is to refute the hypothesis that the most probable errors are always considerably less then the max errors. As it

225T64

turns out, the max errors are the most probable errors. Considers the recurrent formula $x_{m+1} = Ax_m + b$, where A is a matrix.

225T64

KREYN, [illegible]

Mathematical Reviews
Vol 14 No. 7
July - August, 1953
Numerical and Graphical Methods.

Krasnosel'skiĭ, M. A., and Kreĭn, S. G. An iteration process with minimal residuals. Mat. Sbornik N.S. 31(73), 315–334 (1952). (Russian)

Let B be a real positive definite matrix. The authors introduce the "α-processes," a family of gradient methods for solving a system of linear equations $Bx = b$, depending on a real parameter α. Let x_0^α be arbitrary. For each $k = 0, 1, \cdots$, a sequence $\{x_k^\alpha\}$ converging to $x^* = B^{-1}b$ is defined by letting $x_{k+1}^\alpha = x_k^\alpha - c_\alpha \Delta_k^\alpha$, where $\Delta_k^\alpha = Bx_k^\alpha - b$, and where $c_\alpha = (B^\alpha \Delta_\alpha^\alpha, \Delta_\alpha^\alpha)/(B^{\alpha+1}\Delta_\alpha^\alpha, \Delta_\alpha^\alpha)$. (In x_k^α and Δ_k^α, α is a superscript; but B^α is the αth power of B.)

For real γ, let $\|s\|_\gamma$, the "γ-length" of s, be $(s, B^\gamma s)^{\frac{1}{2}}$. Then the α-process selects x_{k+1}^α among all vectors of the form $x_k^\alpha - \gamma\Delta_k^\alpha$ $(-\infty < \gamma < \infty)$ so as to minimize $\|x_{k+1}^\alpha - x^*\|_{\alpha+1} = \|\Delta_{k+1}^\alpha\|_{\alpha-1}$. By a very simple argument it is shown that all α-processes have the same norm, i.e., one always has

$$\|\Delta^\alpha_{k+1}\|_{\alpha-1} \leq \left(\frac{M-m}{M+m}\right)\|\Delta_k^\alpha\|_{\alpha-1}.$$

4/11/54

where m, M are the least, greatest eigenvalues of B, and equality is attained for some x_k^*. (Details are missing on the matter of equality.) In a preliminary theorem it is shown that log $(B^\alpha x, x)$ is a convex function of α.

The 0-process is the method of steepest descent of Kantorovich and others, while the 1-process is proposed for practical use and given the name of the title. The choice between the two depends on what measure of the error one is striving to reduce. In addition to the minimizing nature of the 0- and 1-processes inherent in the above, it is shown that the 0-process is the best of the "practically realizable" α-processes (i.e., $\alpha=0, 1, 2, \cdots$) in the one-step reduction of $\|x_k-x^*\|_0$. The non-linear transformation L: $x_k^1 \to x^1_{k+1}$ is studied in some detail; it is shown that L is commonly $n-1$ to 1. *G. E. Forsythe* (Los Angeles, Calif.).

KREYN, S. G.

Mathematical Reviews
Vol. 14 No. 8
Sept. 1953
Analysis

Kreĭn, S. G. On invariant points in conformal mapping. Uspehi Matem. Nauk (N.S.) 8, no. 1(53), 155–159 (1953). (Russian)

G. N. Položiĭ has shown [Uspehi Matem. Nauk (N.S.) 7, no. 6(52), 203–205 (1952); these Rev. 14, 549] that if a simply-connected region G is mapped conformally onto a simply-connected subregion G_1 which has a simple arc γ of its boundary in common with that of G, then there can be at most three fixed points on γ in the correspondence of the boundaries. In the case that there are exactly three such fixed points, the outer two are attractive while the inner one is repellent. In the case of two fixed points, one is repellent, the other attractive, while a single fixed point is repellent. The author extends Položiĭ's result to the case that the boundaries of G and G_1 have n such arcs in common. It is shown that in each of these arcs, with the possible exception of one of them, there can be at most one fixed point, which is always repellent, while in the exceptional arc there can be at most three fixed points, which follow Položiĭ's rule of attraction. If, however, there is an interior point of G_1 which goes into itself under the mapping, there can be no exceptional arc. *A. J. Lohwater.*

KREYN, S.G.

See Krasnosel'skiy, M.A. Remark on the distribution of errors in the solution of a system of linear equations by means of an iterative process.

SO: MATHEMATICAL REVIEW (unclassified)
Vol XIV, No 5, May 1953, pp 439-522

KREYN, S. G.

Mathematical Review
June 1954
Topology

10-7-54
LL

(1)

Krein, S. G. **Uniform topology in the space of transformations.** Mat. Sbornik N.S. 33(75), 627-638 (1953). (Russian)

Denote by $M(Q, R)$ the set of all functions of a set Q into a bicompact Hausdorff space R. Let α be a finite open covering of R. If $\phi_0 \in M(Q, R)$ define $A_\alpha(\phi_0)$ to be the set of all $\phi \in M(Q, R)$ such that, for each $p \in Q$, $\phi(p)$ and $\phi_0(p)$ both lie in an element of α. The collection of neighborhoods $A_\alpha(\phi_0)$ makes $M(Q, R)$ into a uniform space; it is proved to be complete in this uniformity. A subset D of M is defined to be equivariant in case for each finite open covering α of R, there exists a subdivision $Q = \bigcup_1^r E_j$ such that for each $\phi \in D$ and each j, the closure of $\phi(E_j)$ is contained in an element of α. It is proved that D is equivariant if and only if it has a bicompact closure. In case Q is a topological space, let $C(Q, R)$ denote the set of continuous functions from Q to R. Then $C(Q, R)$ is a closed subset of $M(Q, R)$. If $D \subseteq C$ and ϕ_0 is a limit point of D in the weak topology, a criterion is given for continuity of ϕ_0. This criterion is a generalization of classical theorems.

E. E. Floyd.

KREYN, S.G.

1/2

Krein, S. G. On functional properties of operators of vector analysis and hydrodynamics. Doklady Akad. Nauk SSSR (N.S.) 93, 969–972 (1953). (Russian)

Soient: G, un domaine borné, étoilé relativement à l'origine; Γ la frontière de G; H l'espace de Hilbert de vecteurs $\mathbf{V}(x, y, z)$, définis dans G, tels que $\iiint|\mathbf{V}|^2 d\tau < \infty$, le produit scalaire $(\mathbf{V}, \mathbf{W})$ de deux éléments de H étant défini au moyen de la formule:

$$(\mathbf{V}\cdot\mathbf{W}) = \iiint \mathbf{V}\cdot\mathbf{W}\,d\tau;$$

D, un sous espace de H, fermeture de l'ensemble des vecteurs solénoïdaux de H. L'auteur définit des opérateurs convenables, au moyen desquels il construit un élément $\mathbf{W} \in D$, solution du système:

$$\Delta\mathbf{W} = \operatorname{grad} p; \quad \operatorname{div}\mathbf{W} = 0$$

prenant sur Γ (le sens de cette locution étant précisé par l'auteur) les mêmes valeurs qu'un vecteur $\mathbf{f}(x, y, z)$, donné à priori, assez régulier, $\mathbf{f} \in D$. A noter que la scalaire $p(x, y, z)$ est harmonique et que la solution $\mathbf{W}$ est indéfiniment différentiable. De même, l'auteur construit un opérateur convenable sur un autre sous-espace de H. Il peut alors former une solution du système:

(over)

KREĬN, S. G. 2/2

$$\Delta V = \operatorname{grad} p - g, \quad p = -\frac{1}{4\pi}\iiint_{G} \frac{g \cdot r}{r^3} d\tau.$$

Ces résultats constituent les généralisations des théorèmes d'existence des solutions pour les équations linéaires de l'hydrodynamique des liquides visqueux, dont la première version est du à Odqvist [Math. Z. 32, 329–375 (1930)]. Les conclusions ci-dessus comportent divers corollaires: (1) l'existence de petits mouvements du liquide visqueux enfermé dans un vase autour d'une position d'équilibre; (2) la justification des procédés variationnels pour le calcul de ces petits mouvements, etc. Un énoncé concernant les petits mouvements autour d'un régime stationnaire complète ce mémoire.

J. Kravtchenko (Grenoble).

LB
3/3/55

KREYN, S.G.

USSR/Mathematics - Potential theory

FD-1168

Card 1/1 Pub. 118-9/30

Author : Kreyn, S. G.

Title : An indeterminate equation in a Hilbert space and its application in the theory of potential

Periodical : Usp. mat. nauk, 9, No 3(61), 149-153, Jul-Sep 1954

Abstract : In reading the work of H. Weyl ("Kapazitaet von Strahlungsfeldern," [Capacity of radiation fields], Math. Zeistschrift, 55, 2, 1952), which was devoted to demonstrating the theorem of the existence of the solution to the boundary-value problem for the equation $\Delta u + k^2 u = 0$, the author of the present set for himself the methodological goal of distinguishing the general positions held in the theory of operators which are necessary in order to prove the theorem from the specific peculiarities of the concrete problem in question. Three references, 1 German and 2 USSR.

Institution :

Submitted : October 3, 1953

KREYN, S.G.

Krasnosel'skiĭ, M. A., and Kreĭn, S. G. On the principle of averaging in nonlinear mechanics. Uspehi Mat. Nauk (N.S.) 10 (1955), no. 3(65), 147–152. (Russian) 1-F/W

MS

1/✓

Given the system

(1) $$\dot{x} = \varepsilon X(x, t)$$

with x, X n-vectors and x varying in a bounded domain D of E^n, suppose that for every x in D

(2) $$\lim_{T\to+\infty} \frac{1}{T}\int_0^T X(x, t)\,dt = X_0(x)$$

exists. Take now the system

(3) $$\dot{y} = \varepsilon X_0(y)$$

and let $x(t)$, $y(t)$ be solutions of (1) and (3) such that $x(0)=y(0)=x_0$. Bogoliubov proved [On some statistical methods in mathematical physics, Akad. Nauk Ukrain. SSR, 1945; MR 8, 37] the following theorem. Let $X(t, x)$ be bounded in D and satisfy there a Lipschitz condition with constant independent of x, t. Let also the limit (2) exist for every x in D. Suppose finally that $y(t)$ is known for $\varepsilon=1$ and $t \in [0-T]$ and together with a certain neighborhood does lie in D. Then, given $\eta>0$, there exists $\varepsilon_0>0$ such that for $0<\varepsilon<\varepsilon_0$, $x(t)$ as defined above is in modulus within an η-neighborhood of $y(t)$ on $t \in [0-T/\varepsilon]$.

(000)

1

6

[illegible], M.A., and [illegible], S.G.,

It was shown by Gikhman [Ukrain. Mat. Ž. 4 (1952), 215-218 (unavailable for review)] that the above theorem is a ready consequence of a theorem on the continuous dependence of the solution of a differential equation on a parameter. Gikhman leaned heavily upon the Lipschitz condition. His result is proved here under much more general conditions, and this extends considerably the reach of the theorem of Bogoliubov. *S. Lefschetz.*

2/2

[illegible]

KREYN S.G.

SUBJECT USSR/MATHEMATICS/Differential equations CARD 1/3 PG - 74
AUTHOR KRASNOSEL'SKIJ M.A., KREJN S.G.
TITLE Non-local theorems of existence and uniqueness for systems of ordinary differential equations.
PERIODICAL Doklady Akad. Nauk 102, 13-16 (1955)
reviewed 6/1956

Let be

(1) $\frac{dx}{dt} = f(x,t)$, where $f(x,t)$ $(x \in E, -\infty < t < +\infty)$ is a continuous operator with range of values in the Banach space E. If $f(x,t)$ is representable as the sum of a completely-continuous operator and one which satisfies the Lipschitz condition, then the local existence theorem is valid according to which a $h_0 > 0$ can be given such that (1) has a solution for $t_0 - h_0 \leq t \leq t_0 + h$ which satisfies the initial condition $x(t_0) = x_0$. The authors ask for conditions under which all solutions of (1) can be continued on the interval $[t_0, \infty)$.

Let $L(n) \geq 0$ be continuous and $\psi(t) \geq 0$ be integrable on every finite interval. Let $\{\Phi_i(x)\}_{i=1}^m \geq 0$ be functionals defined on E the gradients of which are continuous operators on E. $\Phi(x) = \max_i \Phi_i(x) \cdot j(x)$ are those indices i for which $\Phi_i(x) = \Phi(x)$ for given x. Then the following lemma is valid: If $f(x,t)$

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

satisfies the condition

(2) $$(\Gamma_{j(x)}x, f(x,t)) \leq L[\phi(x)]\psi(t),$$

where $(1,x)$ denotes the value of the linear functional 1 on the element x, and if $x(t)$ is the solution of (1) for $t_1 \leq t \leq t_2$, then

(3) $$\int_{t_1}^{t_2} \psi(t)dt \geqslant \int_{\phi[x(t_1)]}^{\phi[x(t_2)]} \frac{du}{L(u)} .$$

From the lemma follows the theorem: If (2) is satisfied, for $\|x\| \to \infty$ also $\phi(x) \longrightarrow \infty$ and for every $A > 0$

(4) $$\int_A^{\infty} \frac{du}{L(u)} = \infty,$$

then all solutions of (1) are continuable on the interval $[t_0, \infty]$. This theorem can be applied for the investigation of a system

(5) $$\frac{dx_i}{dt} = f_i(x_1,\ldots x_n,t) \qquad (i=1,\ldots n)$$

if it is considered as an equation (1) defined in the n-dimensional euclidean space. Choosing for $\phi(x)$ several functions of the n variables, then for (5)

one can obtain several non-local existence theorems. In three cases for different $\phi(x)$ the concrete condition (2) is given.
From the lemma follows still a general theorem of uniqueness: $x = x_1(t)$ and $x = x_2(t)$ be two solutions of (1) satisfying the same initial condition.
Let be $\phi(0) = 0$ and

$$(\Gamma_{j(x_1-x_2)}(x_1-x_2),\ f(x_1,t)-f(x_2,t)) \leq L\left[\phi(x_1-x_2)\right]\psi(t),$$

where for every $\varepsilon > 0$

$$\int_0^{\varepsilon} \frac{du}{L(u)} = \infty,$$

then $x_1(t) \equiv x_2(t)$.
The given theorems can be used for the proof of the non-local theorems of existence and uniqueness of theintegro-differential equations.

INSTITUTION: Public University Voronež.

SOV/124-57-9-10375

Translation from: Referativnyy zhurnal, Mekhanika, 1957, Nr 9, p 69 (USSR)

AUTHOR: Kreyn, S.G.

TITLE: Mathematical Aspects of the Theory of the Motion of a Solid Body With Cavities Filled With Fluid (Matematicheskiye voprosy teorii dvizheniya tverdogo tela s polostyami, napolnennymi zhidkost'yu)

PERIODICAL: Tr. 3-go Vses. matem. s"yezda. Vol I. Moscow, AN SSSR, 1956, pp 205

ABSTRACT: The paper analyzes aspects of the existence of a motion of a viscous incompressible fluid and of eddy motions of an ideal fluid during a given motion of the body containing it and with given initial conditions. Nonlinear and linearized problems are analyzed. The author studies the problems of the existence of small oscillations of the fluid, of the totality of the system of normal oscillations, and of the characteristics of the frequency spectrum in three cases: The motions of an ideal fluid approximating a state of equilibrium with the presence of a free surface, the motions of an ideal fluid approximating its rotation as a solid body, and the oscillations of a viscous fluid approximating stationary motion. In the latter part of the paper the combined oscillations of a solid body and a fluid are studied on similar cases. Annot.

Card 1/1

KREYN, S.G.

Transactions of the Third All-union Mathematical Congress (Cont.) Moscow, Jun-Jul '56, Trudy '56, V. 1, Sect. Rpts., Izdatel'stvo AN SSSR, Moscow, 1956, 237 pp.

Krasnosel'skiy, M. A. (Voronezh). On the Investigation of Bifurcation Points of Non-linear Equation. 204-205

Kreyn, S. G. (Voronezh). Mathematical Problems in ~~the Theory of~~ Motion of Solid Bodies With Fluid-filled Cavities. 205

Kupradze, V. D. (Tbilisi). On Some New Research at the University of Tbilisi in the Mathematical Theory of Elasticity. 205

Mikhaylov, G. K. (Moscow). Precise Solution of a Problem on Stabilized Motion of Ground Water in Vertical Plane With Free Surface and Feeding Zone. 205-206

Mention is made of Polubarinova-Kochina, P. Ya.

Movchan, A. A. (Moscow). Linear Oscillations of a Plate Moving in Gas at High Velocity. 206

Card 68/80

KREYN, S. G.

Daleckii, Yu. L.; and Krein, S. G. Integration and differentiation of functions of Hermitian operators and applications to the theory of perturbations. Voronež. Gos. Univ. Trudy Sem. Funkcional. Anal. no. 1 (1956), 81–105. (Russian) I-FW

The proof and applications are given of a formula for the differential coefficient of a function $f(H(t))$, where $H(t)$ is a bounded Hermitian operator defined and differentiable for t in some segment of the real line, and f a function with continuous second derivatives on a segment (a, b) of the real line containing the spectrum of $H(t)$ for all t in the segment of definition. The formula is

$$\frac{df(H(t))}{dt} = \int_a^b \int_a^b \frac{f(\lambda) - f(\mu)}{\lambda - \mu} \, dE_\lambda(t) \, \frac{dH(t)}{dt} \, dE_\mu(t).$$

1/2

Daleckii, Yu. L. + Krein, S. G. 5

1-FW

where $E_\lambda(t)$ is the spectral projector of $H(t)$.

The formula is extended to higher order derivatives by iteration, and a Taylor's theorem, with the integral form of the remainder, is proved. The differential coefficients of the operator functions and the integrals are understood to exist in the sense of convergence by operator norms; the properties of the Stieltjes integral with respect to the spectral function are discussed in some detail. By taking f to be a function equal to 1 on an isolated portion of the spectrum and zero elsewhere on the spectrum of H, applications are given to perturbation theory: the formulae simplify considerably when $H(t)$ is linear in t. Estimates for the error term in the Taylor's expansion are given. The principal results have appeared without proof in Dokl. Akad Nauk SSSR (N.S.) 76 (1951), 13-16; Dopovidi Akad. Nauk Ukrain. RSR 1951, 234-238 [MR 12, 617; 16, 264]. *J. L. B. Cooper* (Cardiff).

2/2

KREYN, S. G.

Krasnosel'skiĭ, M. A.; and Kreĭn, S. G. On the theory of ordinary differential equations in Banach spaces. Voronež. Gos. Univ. Trudy Sem. Funkcional. Anal. no. 2 (1956), 3–23. (Russian) 1-FW

Slight extensions and detailed proofs of results stated by the same authors in Dokl. Akad. Nauk SSSR (N.S.) 102 (1955), 13–16 [MR 17, 151]. *F. A. Ficken.* 3

1/1

SOV/137-57-10-18584

Translation from: Referativnyy zhurnal, Metallurgiya, 1957, Nr 10, p 15 (USSR)

AUTHORS: Kreyn, S.G., Reshotka, Kh.S.

TITLE: Analysis of the Field in an Electromagnetic Separator With Allowance for the Mutual Effects of Adjacent Pole Terminals (Raschet polya v elektromagnitnom separatore s uchetom vzaimnogo vliyaniya sosednikh polyusnykh nakonechnikov)

PERIODICAL: Sb. tr. Krivorozhsk. gornorudn. in-t, 1956, Nr 5, pp 134-148

ABSTRACT: Earlier a study had been made of the two-dimensional magnetic field arising between the infinitely thin poles, either wedge-shaped or flat, of a magnet (Derkach, V.G., Gornyy zh., 1950, Nr 1). The present work is devoted to an investigation of the field existing with such a system of pointed poles. Fundamental here, is the choice of a distance between the pointed poles at which the mutual influence of the respective poles would not lead to any noticeable reduction in the magnetic force exerted on a particle of ore. Equations are put forth for calculation of the mutual effects of like poles of the magnetic force, and of the intensity of the field. It is found that the optimum radius of curvature is r = 0.15 ℓ,

Card 1/2

Analysis of the Field in an Electromagnetic Separator (cont.) SOV/137-57-10-18584

representing an angle in which ℓ is the minimum distance between opposite poles of the magnets and r is the radius of curvature of a rounded magnet at its lowest point.

A. Sh.

Card 2/2

KREYN, S. G.

3

Krasnosel'skii, M. A.; and Krein, S. G. On a class of uniqueness theorems for the equation $y'=f(x, y)$. Uspehi Mat. Nauk (N.S.) 11 (1956), no. 1(67), 209–213. (Russian)

Consider the problem $y'=f(x, y)$, $y(x_0)=y_0$, with $|f(x, y_1)-f(x, y_2)||(x-x_0)\leq k|y_1-y_2|$ on R: $x_0\leq x\leq x_0+a$, $|y-y_0|\leq b$. If $f(x, y)$ is continuous on R then an improvement by Perron [Math. Z. 28 (1928), 216–219] of a theorem of Rosenblatt yields uniqueness of the solution if $k\leq 1$. The principal result in the paper under review is that if also $|f(x, y_1)-f(x, y_2)|\leq p|y_1-y_2|^\alpha$ on R, with p fixed and $0<\alpha<1$, then uniqueness follows if in the first condition merely $k(1-\alpha)<1$. Using appropriate Banach spaces, the authors obtain similar uniqueness theorems for an integro-differential equation, for a system of ordinary differential equations, and for $y'=f(x, y)$ with $y_0=\lim y(x)$ as $x\to\infty$.

F. A. Ficken (Knoxville, Tenn.)

Math

2/6

SUBJECT USSR/MATHEMATICS/Functional analysis CARD 1/3 PG - 7..
AUTHOR KRASNOSEL'SKIJ M.A., KREJN S.G., SOBOLEVSKI P.E.
TITLE On differential equations with bounded operators in Banach spaces.
PERIODICAL Doklady Akad.Nauk 111, 19-22 (1956)
reviewed 4/1957

The authors consider the equation

(1) $$\frac{dx}{dt} = A(t)x + f(t,x),$$

where $x(t)$ is the sought function with a range of values in the Banach space E, $A(t)$ and $f(t,x)$ are operators in E and besides $A(t)$ is unbounded, closed and linear for every t. A solution is sought which satisfies the initial condition

(2) $$x(0) = x_0,$$

where x_0 belongs to the region of definition $D(A)$ of the operator $A(0)$. The authors use the theory of semigroups and therefore it is assumed that $A(t)$ is the generating operator of a strongly continuous semigroup of bounded operators $T(\xi)$ ($\xi > 0$) for every t. At first the linear equation

$$\frac{dx}{dt} = Ax + f(t)$$

is considered, where A is independent of t. Let Q be the linear operator

Doklady Akad.Nauk 111, 19-22 (1956) CARD 2/3 PG - 7??

$$Qx(t) = \int_0^t T(t-x)x(\tau)d\tau.$$

Theorem: a) Q acts and is continuous in the space C_L of functions which satisfy the Lipschitz condition. If for $\xi > 0$ the semigroup $T(\xi)$ is continuous with respect to the norm (condition C_n according to Hill), then Q acts from C_L to C_1 and is continuous. b) if A^{-1} is completely continuous then Q as an operator from C_L to C is completely continuous too.

Theorem: Let $T(\xi)$ satisfy the condition C_n and let f(t) be continuous and have a strongly bounded variation. For $x_0 \in D(A)$ the formula

$$x(t) = T(t)x_0 + Qf(t)$$

yields the solution of (1)-(2).

Let be given a homogeneous linear equation $\frac{dx}{dt} = A(t)x$ and let be satisfied the condition α) $C(t) = A(t)\frac{d}{dt}A^{-1}(t)$ bounded and strongly continuous in t.

Theorem: If α) is satisfied, then 1) the operators A(t) have a common region

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

of definition, 2) the operators $B(t,s) = A(t)A^{-1}(s)$ are continuous with respect to the norm in t and s and 3) the derivative $\frac{\partial B(t,s)}{\partial t}$ is strongly continuous for every s in t.
If 1) and 3) are satisfied, then α) is satisfied too. This theorem and a further one are in direct connection with the investigations of Kato (J.Math.Soc.Jap 5, no.2, (1953)).
Then the non-linear equation (1) is treated. A generalized solution of (1)-(2) means a function x(t) which satisfies the operator equation

$$x(t) = Qf\left[t,x(t)\right] + U(t,0)x_0 . \quad (3)$$

For the proof of the theorems of existence theorems of fixed points are used. For a sufficient smoothness of f(t,x) in some cases it can be shown that the generalized solutions the existence of which was proved, are ordinary solutions of (1). Some examples are considered.

SUBJECT USSR/MATHEMATICS/Algebra CARD 1/1 PG - 736
AUTHOR BEREZANSKI Ju.M., KREJN S.G.
TITLE Hypercomplex systems with an infinite basis.
PERIODICAL Uspechi mat.Nauk 12, 1, 147-152 (1957)
reviewed 5/1957

An ordinary hypercomplex system the elements of which are n-dimensional vectors x, can be understood as a ring of complex-valued functions $x(j) = x_j$ which are defined on a basis Q consisting of n points, where the ordinary addition and multiplication with a scalar and the composition

$$(x * y)(l) = \sum_{j,k=1}^{n} x(j)y(k)c_{jkl}$$

c_{jkl} - structural constants, are valid. The authors extend the notion of the commutative hypercomplex system to the case that Q is a locally compact metric space. The authors restrict themselves to positive structural constants. Then it is shown that by restricting to (in a certain sense) symmetric hypercomplex systems, to these systems the principal results of the harmonic analysis on commutative locally compact groups can be transferred. Numerous examples are given.

SUBJECT	USSR/MATHEMATICS/Differential equations	CARD 1/2	PG - 780
AUTHOR	KREJN S.G.		
TITLE	Differential equations in the Banach space and their application in hydromechanics.		
PERIODICAL	Uspechi mat.Nauk 12, 1, 208-211 (1957) reviewed 5/1957		

The author considers the motion of a tenacious fluid in a closed vessel which carries out a given motion around a fixed point. The system of motion equations is non-linear and not of the type of Cauchy-Kowalevski since the derivative with respect to the time of one of the wanted functions ($\frac{dp}{dt}$, p - pressure) does not appear in the equations. The author shows that by introduction of a suitable Hilbert space and by decomposition of it into an orthogonal sum of two subspaces the unknown function p can be eliminated, while for the other unknown function v (relative velocity) an equation of the type

$$\frac{dv}{dt} = Av + g(t,v,B_1v,\dots,B_nv) \qquad (1)$$

is obtained. Here A is a negative definite operator in the Hilbert space and the operators B_i depend on $(-A)^{1/2}$. With the aid of the operator

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

Uspechi mat.Nauk 12, 1, 208-211 (1957) CARD 2/2 PG - 780

$Q = (A - \frac{d}{dt})^{-1}$ the non-linear equation (1) can be reduced to an integral equation which has a solution in a sufficiently short time.
With this consideration the author wishes to point out the importance of the investigation of differential equations in Banach spaces.

KRASNOSEL'SKIY, M.A.; KREYN, S.G.; MYSHKIS, A.D.

The broadened sessions of the Voronezh Seminar on Functional Analysis in March 1957. Usp.mat.nauk 12 no.4:241-250 Jl-Ag '57. (MIRA 10:10)

(Voronezh--Functional analysis)

KREYN, S. G.

40-21-2-3/22

AUTHOR: Kreyn, S.G., Moiseyev, N.N. (Voronezh, Moscow)

TITLE: On the Oscillations of a Solid Body in the Interior of Which There is a Fluid With a Free Surface (O kolebaniyakh tverdogo tela, soderzhashchego zhidkost' so svobodnoy poverkhnost'yu)

PERIODICAL: Prikladnaya Matematika i Mekhanika, 1957, Vol 21, Nr 2 pp 169-174 (USSR)

ABSTRACT: Under the influence of conservative forces a solid body with a cavity partially filled with a fluid carries out small oscillations which are described by the following equations (due to N.N.Moyseyev, Thesis, Mathematical Institute, Academy of Sciences, Moscow 1955):

$$Y_i'' + \int_S \gamma_i(P)\zeta''(P,t)dP + \mu_i^2 Y_i + \int_S \nu_i(P)\zeta(P,t)dP = Q_i(t) \quad (i=1,\dots,6)$$

(1)

$$\rho g\zeta(P,t) + \int_S H(P,Q)\zeta''(Q,t)dQ + \sum_{n=1}^{6} Y_n''\gamma_n(P) + \sum_{n=1}^{6} Y_n \nu_n(P) = 0$$

Here the Y_i are the generalized coordinates of the body,

Card 1/3

On the Oscillations of a Solid Body in the Interior of Which 40-21-2-3/22
There is a Fluid With a Free Surface

$z = \zeta(P,t)$ is the equation of the free surface; ν_i and γ_i are functions of the point which are determined only by the geometrical properties of the cavity; μ_i^2 are constants which determine the conservative reforces; $Q_i(t)$ - outer forces; S - the plane domain corresponding to the free surface in the state of equilibrium; ρ-density of the fluid; g - constant field tension; $H(P,Q)$ - the Green's function for the Neumann's problem for the domain occupied by the fluid. The motions for $Q_i \equiv 0$ are said to be free oscillations.
With the aid of function-theoretical methods the authors prove: For motions of the considered body around the state of equilibrium there appear normal oscillations, i.e. (1) has solutions of the form

$$(2) \quad Y_{jn} = q_{jn} e^{i\omega_n t}, \quad \zeta_n = z_n e^{i\omega_n t} \quad (i=\sqrt{-1},\ j=1,\dots,6).$$

In order that the state of equilibrium is stable (i.e. (2) remains bounded for all t) it is necessary and sufficient that the matrix

Card 2/3

On the Oscillations of a Solid Body in the Interior of Which 40-21-2-3/22
There is a Fluid With a Free Surface

$$\left\| \mu_j^2 \delta_{jk} - \frac{1}{\varrho g} \int \vartheta_j(P)\, \vartheta_k(P)\, dP \right\| \qquad j,k=1,\ldots,6$$

is positive definite (δ_{jk} - Kronecker's δ). Then all frequencies ω_n are real and $\omega_n^2 \to \infty$ as $n \to \infty$. Besides then in the metric of the L_2, (2) is a complete system of solutions. In this case the Cauchy problem has a unique solution defined for all t if the $Q_j(t)$ are of bounded variation on every finite interval.
There are 8 references, 7 of which are Soviet and 1 American.

SUBMITTED: March 9, 1956

AVAILABLE: Library of Congress

1. Solids--Oscillations--Theory

Card 3/3

KREYN, S.G.

SUBJECT USSR/MATHEMATICS/Functional analysis CARD 1/3 PG - 874
AUTHOR KRASNOSEL'SKIJ M.A., KREJN S.G., SOBOLEVSKIJ P.E.
TITLE On differential equations with unbounded operators in the Hilbert space.
PERIODICAL Doklady Akad.Nauk 112, 990-993 (1957)
reviewed 6/1957

Joining a paper of Kato (J.Math.Soc.Japan, 5, 2, (1953)) the authors investigate the equation

(1) $$\frac{dx}{dt} + A(t)x = f(t)$$

in the Hilbert space H. Kato constructed the solution of (1) in the Banach space in the form

(2) $$x(t) = U(t,0)x_0 + Qf(t),$$

where the solution of the homogeneous equation has the form

$$x(t) = U(t,s)x_0$$

with a continuous and bounded operator U(t,s) and with the initial condition

Doklady Akad. Nauk 112, 990-993 (1957) CARD 2/3 PG - 874

$x(s) = x_0$ and

$$Qf(t) = \int_0^t U(t,s)f(s)ds.$$

In the special case considered by the authors, about U and Q more exact assertions can be made. Here it is assumed that 1) $A(t)$ is selfadjoint and $(A(t)x,x) \geqslant (x,x)$, 2) for $0 \leq \alpha \leq 1$, $A^{-\alpha}(t)$ is differentiable, where $C_\alpha(t) = A^\alpha(t)\frac{d}{dt}A^{-\alpha}(t)$ are uniformly bounded with respect to α and t. 3) $C_1(t)$ is strongly continuous in t and bounded. It is shown that under certain conditions of 1) and 3) there follows the condition 2). Furthermore: $x(t) = U(t,s)x_0$ satisfies the homogeneous equation for all $x_0 \in H$. For $t > s$ and $0 \leq \alpha < 2$ the operators $A^\alpha(t)U(t,s)$ are bounded, where $\|A^\alpha(t)U(t,s)\| \leqslant M(t-s)^{-\alpha}$. This estimation also holds for $\alpha = 2$ if $\|C(t)-C(s)\| \leqslant L|t-s|^\beta$. The estimation holds for all α if A is constant. If f(t) satisfies the condition Lip ε with $\varepsilon \leq 1$, then (2) is a solution

of (1) for all $x_0 \in H$ and $t > 0$. If x_0 lies in the region of definition of A, then this solution has the property $\|A^{\alpha}(t)\frac{dx}{dt}\| \leqslant M|t|^{-\alpha}$ for $\alpha < \mathcal{E}$.
Let C be the space of the functions f(t) being continuous on $[0,b]$ with the values in H and the norm $\|f\|_C = \max \|f(t)\|$ and let C_0' be the space of continuously differentiable functions which vanish for $t = 0$ and the norm of which is $\|f\|_{C_0'} = \max \|f'(t)\|$. If $f(t) \in C$, then it holds

$$\|Qf(t+\Delta t) - Qf(t)\| \leqslant K_1 \Delta t \,|\ln \Delta t| \cdot \|f\|_C ,$$

if $f(t) \in C_0'$, then we have

$$\left\|\frac{d}{dt} Qf(t+\Delta t) - \frac{d}{dt} Qf(t)\right\| \leqslant K_2 \Delta t \,|\ln \Delta t| \cdot \|f\|_{C_0'} .$$

If $A^{-1}(t)$ is completely continuous, then Q is completely continuous in C and C_0'. Furthermore the equation (3) $\frac{dx}{dt} + A(t)x = f(t,x)$ is considered. It is stated that the integral equation (4) $x(t) = U(t,0)x_0 + Qf[t,x(t)]$ has a solution on a certain interval. If $\|f(t+\Delta t, x+\Delta x) - f(t,x)\| \leqslant K(|\Delta t|^{\alpha} + \|\Delta x\|^{\alpha})$ $(\alpha \leqslant 1)$, then every continuous solution of (4) is also a solution of (3) for $t > 0$.

KREYN, S.G.

KREYN, S.G.

Correctness classes for certain boundary problems. Dokl. AN SSSR 114 no.6:1162-1165 Je '57. (MLRA 10:9)

1. Predstavleno akademikom I.G.Petrovskim.
(Differential equations) (Hilbert space)

Kreyn, S. G., Moiseyev, N. N., Oscillations of a solid body containing a liquid with a free surface, Prikl. matem. i mekhan. (Applied Mathematics and Mechanics), //ɸ1/2 Vol 21, No 2, 1957, p 169-174; (RZhMekh 6/59-6265)

20-114-6-7/54

AUTHOR: Kreyn, S. G.

TITLE: On Correctness Classes for Certain Boundary Problems (O klassakh korrektnosti dlya nekotorykh granichnykh zadach)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 6, pp. 1162-1165 (USSR)

ABSTRACT: The present paper studies this problem for partial differential equations. (Equations of inverse thermal conduction and several elliptic equations). The here investigated boundary conditions are correct in a class of solutions which are uniformly bounded in the metrics of a certain Hilbert space. Reference is made to pertinent preliminary works. The corresponding partial differential equations are here treated as ordinary differential equations in a Hilbert space, whereby the problem of correctness can be solved by elementary means. H here signifies the Hilbert space, and A (t) for every t of the segment $[0, \tau]$ signifies an unlimited operator that acts in this space. The author here examines the differential equation
(1) $dx/dt + A(t)x = 0$ with the initial conditions $x(0) = x_0$.
The proof of the theorems of correctness of the just mentioned problem is based upon the following chief theorem: A(t) is a

Card 1/2

20-114-6-7/54

On Correctness Classes for Certain Boundary Problems

self-adjungate operator whose defining range is independent of t. In the defining range a strong derivative dA/dt exists, where the unbalanced equation

$$\left(\frac{dA}{dt}x,x\right) \leqslant k(Ax,x) \quad (x \in D(A), \quad t \in (0,T)) \text{ applies.}$$

For every solution of equation (1) the inequation

$$\| x(t) \| \leqslant \| x(0) \|^{1-\alpha(t)} \| x(T) \|^{\alpha(t)}$$

applies, where $\alpha(t) = (e^{kt} - 1)/(e^{kT} - 1)$ is true. There then follow a proof of this theorem, two corollaries, and a second theorem. Thereafter the differential equations

$$d^2x/dt^2 - Ax = 0 \text{ and } \partial^2u/\partial t^2 + \Lambda u \text{ are examined.}$$

There are 7 references, 5 of which are Slavic.

PRESENTED: December 19, 1956, by I. G. Petrovskiy, Member of the Academy

SUBMITTED: December 18, 1956

Card 2/2

AUTHOR: Kreyn, S.G. and Sobolevskiy, P.Ye. 20-118-2-7/60

TITLE: Differential Equation With Abstract Elliptic Operator in the Hilbert Space (Differentsial'noye uravneniye s abstraktnym ellipticheskim operatorom v gil'bertovom prostranstve)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol 118, Nr 2, pp233-236 (USSR)

ABSTRACT: In the differential equation

(1) $$\frac{dv}{dt} + A v = 0$$

let A be an unbounded operator in the Hilbert space H with a domain $D(A)$ which is everywhere dense. Let the solution $v = v(t)$ satisfy the initial condition

(2) $$v(0) = v_0 \in D(A) \quad .$$

The solution of (1) - (2) is denoted as correct, if it exists for all $v_0 \in D(A)$, if it is unique and depends continuously on the initial conditions. Necessary for the correctness of (1) - (2) is the existence of $\bar{A}$ which must be the generating operator of a strongly continuous semigroup $U(t)$ of bounded operators. The operator B is said to have a frac-

Card 1/3

tional order with respect to a positive-definite operator A, if for each $v \in D(A)$ it holds:

$$\|Bv\| \leq K_{\gamma} \| A^{\gamma} v \| , \quad 0 < \gamma < 1 , \quad K_{\gamma} > 0 .$$

The lower bound of γ is denoted the order of B. In order that B has the fractional order α with respect to A, it is necessary (and sufficient for the existence of $\overline{B}$) that for all $v \in D(A)$, $\gamma > \alpha$ and sufficiently small δ it holds:

$$\|Bv\| \leq \delta^{1-\gamma} \|Av\| + \frac{K}{\delta^{\gamma}} \| v \| .$$

The operator S is called elliptic, if S = A+B , where A is self-adjoint and positive-definite and B is of fractional order with regard to A. If A is elliptic in (1), then (1) - (2) is correct. Let $U_A(t)$ in this case be the semigroup generated by (1) . For each $v \in H$ and $t > 0$ the function $U_A(t)v$ satisfies the equation (1) . All the solutions $U_A(t)v$ are analytic in $|\arg t| < \varphi_0$ (φ_0 does not depend on v).

There are 9 references, 3 of which are Soviet.

Differential Equation With Abstract Elliptic Operator in the Hilbert Space 20-118-2-7/60

PRESENTED: July 11, 1957, by I.G. Petrovskiy, Academician

SUBMITTED: July 8, 1957

AVAILABLE: Library of Congress

Card 3/3

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

AUTHORS: Glushko, V.P. and Kreyn, S.G. SOV/20-122-6-2/49

TITLE: Fractional Powers of Differential Operators and Embedding Theorems (Drobnyye stepeni differentsial'nykh operatorov i teoremy vlozheniya)

PERIODICAL: Doklady Akademii nauk, SSSR, 1958, Vol 122, Nr 6, pp 963-966 (USSR)

ABSTRACT: Let G be a bounded domain of the n-dimensional space ($n \geqslant 2$) which is star-shaped with respect to a sphere. In the Hilbert space $L_2(G)$ let a self-adjoint positive-definite operator A be considered which is generated by a differential operator of even order and by a system of homogeneous boundary conditions. A is called strongly invertible, if

$\| A^{-1} f \|_{W_2^1} \leqslant C \|f\|_{L_2}$ $(f \in L_2)$, where W_2^1 is a Sobolev space.

Theorem: Let A be strongly invertible, $0 < \gamma < 1$, $r = \gamma 1 - \frac{n}{2}$.

The following cases are possible
a) r positive, not integer. Then $A^{-\gamma}$ is a completely continuous operator from L_2 into $C_{m,\nu}$ (space of the functions with $m = [r]$ partial derivatives which satisfy the Hölder

Card 1/4

condition with the exponent $\nu < r - [r]$.

b) r positive integer. Then $A^{-\gamma}$ is a completely continuous operator from L_2 into $C_{m,\nu}$, $m = r - 1$ and $\nu < 1$.

c) $r \leqslant 0$. Then $A^{-\gamma}$ is a completely continuous operator from L_2 into L_q, $\frac{1}{q} > -\frac{r}{n} = \frac{1}{2} - \frac{\gamma l}{n}$.

Theorem: Let A be strongly invertible, m positive integer, $\gamma l - \frac{n}{2} \leqslant m < \gamma l$. Then $D^m A^{-\gamma}$, where D^m denotes a partial derivative of order m, is a completely continuous operator from L_2 into L_q, where $\frac{1}{q} > \frac{1}{2} - \frac{\gamma l - m}{n}$. Let M be a point of $\overline{G}$ and

$$D_h^m f(P) = \frac{1}{|M-P|^h} D^m f(P) \qquad (h \geqslant 0).$$

As the order α of the operator D_h^m with respect to the operator A the lower bound of the numbers γ is denoted, for which

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

$D_h^m A^{-\gamma}$ is bounded in L_2.

Theorem: For $0 \leqslant m < 1$, $0 \leqslant h < \min\left\{1 - m, \frac{n}{2}\right\}$ D_h^m is an operator, the order of which with respect to A is not higher than $\frac{m+h}{1}$. For $\frac{m+h}{1} < \gamma < 1$ it is

$$\left\| \frac{1}{|M-P|^h} D^m A^{-\gamma} \varphi \right\|_{L_2} \leqslant K \, \|\varphi\|_{L_2}$$

where K does not depend on $M \in G$.

The proofs of the theorems are based on the somewhat improved results of [Ref 7].

There are 11 references, 8 of which are Soviet, 1 is Italian, 1 German, and 1 American.

PRESENTED: June 5, 1958, by S.L. Sobolev

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

GLUSHKO, V.P.; KREYN, S.G.

Inequalities for the norms of derivatives in L_p -spaces with weight.
Sib. mat. zhur. 1 no.3:343-382 S-O '60. (MIRA 14:2)
(Inequalities (Mathematics)) (Spaces, Generalized)

67902

SOV/20-130-3-2/65

~~16(1)~~ 16.4600

AUTHOR: Kreyn, S.G.

TITLE: ~~An Interpolation~~ Theorem in the Theory of Operators 16

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 3, pp 491-494 (USSR)

ABSTRACT: Let E be a Banach space; M a linear set on which there are defined linear operators $T(z)$ (from M into E) depending on the complex parameter z. Let the following conditions be satisfied:
A. For all $x \in M$ $T(z)x$ is an entire analytic function of z with values in E, $T(z)x \not\equiv 0$. B. $\| T(z)x \|_E$ is bounded on each straight line parallel with the imaginary axis. For real α let

(1) $$\| x \|_\alpha = \sup_{-\infty < \tau < \infty} \| T(\alpha + i\tau)x \|_E .$$

Let the resulted normed space be completed to a Banach space E_α. The family of the E_α $(-\infty < \alpha < \infty)$ is denoted as an analytic scale of spaces. From

(2) $$\| x \|_\beta \leq \| x \|_\alpha^{\frac{\gamma - \beta}{\gamma - \alpha}} \| x \|_\gamma^{\frac{\beta - \alpha}{\gamma - \alpha}} \quad (\alpha \leq \beta \leq \gamma, \; x \in M)$$

Card 1/4

67902 4

An Interpolation Theorem in the Theory of Operators SOV/20-130-3-2/65

it follows

$$(3)\quad \|x\|_{\beta} \leqslant \frac{\gamma-\beta}{\gamma-\alpha}\varepsilon^{-(\gamma-\beta)}\|x\|_{\alpha} + \frac{\beta-\alpha}{\gamma-\alpha}\varepsilon^{\beta-\alpha}\|x\|_{\gamma} \qquad (\varepsilon > 0)$$

Conversely : If (3) is satisfied for all $\varepsilon > 0$, then from this it follows (2). Then the author gives some examples and discusses the possibilities of a generalization of the notion "analytic scale". He formulates a further condition: C. Let the set $M \subset E$ be invariant with respect to the operators $T(z)$. $T(0)$ is unit operator. For every $x \in M$ $T(z)x$ is analytic in every E_{α} and it is

$$(4)\quad \|T(\beta + i\sigma)\|_{\alpha} \leqslant \|x\|_{\alpha+\beta} .$$

Definition : Let the scales $\{E_{\alpha}\}$ and $\{E'_{\alpha}\}$ be constructed with the sets M and M'. $\{E'_{\alpha}\}$ is called conjugate to $\{E_{\alpha}\}$, if there exist a bilinear functional (x,u), $x \in M$ and $u \in M'$, and a linear relation $\alpha \leftrightarrow \alpha^*$, such that

Card 2/4

67902

(5) $$\|x\|_{E_\alpha} = \sup_{u \in M'} \frac{|(x,u)|}{\|u\|_{E'_{\alpha^*}}} .$$

Interpolation theorem 1 : Let $\{E_\alpha\}$ and $\{E_{\bar\alpha}\}$ be two analytic scales; let the scale $\{E'_{\bar\alpha}\}$ conjugate to $\{E_{\bar\alpha}\}$ exist. $\{E_\alpha\}$ and $\{E'_{\bar\alpha}\}$ satisfy C. On the set M corresponding to $\{E_\alpha\}$ an operator Q is assumed to be defined, such that for certain α, β and $\bar\alpha, \bar\beta$ it holds :

(6) $$\|Qx\|_{\bar\alpha} \leq K_1 \|x\|_\alpha , \quad \|Qx\|_{\bar\beta} \leq K_2 \|x\|_\beta \quad (x \in M)$$

Let denote $\alpha(\mu) = \mu\beta + (1-\mu)\alpha$, $\bar\alpha(\mu) = \mu\bar\beta + (1-\mu)\bar\alpha$. Then it is

(7) $$\|Qx\|_{\bar\alpha(\mu)} \leq K_1^{1-\mu} K_2^{\mu} \|x\|_{\alpha(\mu)} .$$

5

67902

An Interpolation Theorem in the Theory of Operators SOV/20-130-3-2/65

The author gives several conclusions and special cases. Theorem 3 : If, under the assumptions of theorem 1, Q is completely continuous as an operator from E_{α} into $E_{\bar{\alpha}}$, then it is also completely continuous as operator from $E_{\alpha(\mu)}$ into E_{γ}, where γ is an arbitrary number between $\bar{\alpha}$ and $\alpha(\mu)$.

Theorem 4 : Let F and G be Banach spaces. If it exists an analytic scale $\{E_{\alpha}\}$, the conjugate scale of which has the property C, and if $E_0 = F$ and $E_1 = G$, then $\{E_{\alpha}\}$ is uniquely determined on $[0,1]$.

The author mentions : V.P. Glushko, M.A. Krasnosel'skiy, S.L. Sobolev and Slobodetskiy. - There are 9 references, 5 of which are Soviet, 2 German, 1 English, and 1 American.

PRESENTED: October 10,1959, by A.N. Kolmogorov, Academician
SUBMITTED: October 9,1959

Card 4/4

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

S/020/60/132/03/06/066

AUTHOR: Kreyn, S.G.

TITLE: On the Notion of Normal Space Scale

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3, pp. 510-513

TEXT: Definition : A family of Banach spaces 16 E_α ($\alpha_0 \leq \alpha \leq \beta_0$) with the norms $\|x\|_\alpha$ is called a normal space scale if
1. for $\beta > \alpha$ the set E_β is contained in the space E_α, is dense in it and

(1) $$\|x\|_\alpha \leq \|x\|_\beta \quad \text{for} \quad x \in E_\alpha$$

2. from $\alpha_0 \leq \alpha \leq \beta \leq \gamma \leq \beta_0$ and $x \in E_\gamma$ there follows

(2) $$\|x\|_\beta \leq \|x\|_\alpha^{\frac{\gamma-\beta}{\gamma-\alpha}} \|x\|_\gamma^{\frac{\beta-\alpha}{\gamma-\alpha}}$$

Let F_0 and F_1 be two Banach spaces, where

(6) $$F_1 \subset F_0, \quad F_1 \text{ dense in } F_0, \quad \|x\|_{F_0} \leq \|x\|_{F_1} \quad (x \in F_1)$$

Card 1/3

1??1

On the Notion of Normal Space Scale S/020/60/132/03/06/066

On $[0,1]$ let be given a normal scale of the spaces E_α, where

(7) $F_o \subset E_o$, $F_1 \subset E_1$, $\|x\|_{E_o} \leq \|x\|_{F_o}$ $(x \in F_o)$,

$$\|x\|_{E_1} \leq \|x\|_{F_1} \quad (x \in F_1)$$

(8) $\lim\limits_{\beta \to 1} \|x\|_{E_\beta} = \|x\|_{E_1}$ $(x \in E_1)$

It is said that the scale E_α bases on the spaces F_o and F_1.

Theorem 1 : Among the normal scales which base on F_o and F_1 there exists one scale G_α $(0 \leq \alpha \leq 1)$ with the properties a) $G_o \overset{o}{=} F_o$; b) F_1 is dense in G_1 ; c) for every normal scale E_α which bases on F_o and F_1 it holds

$$\|x\|_{E_\alpha} \leq \|x\|_{G_\alpha} \qquad (0 \leq \alpha \leq 1 \ , \ x \in F_1)$$

This scale is called maximal.

Theorem 2 : Let the spaces F_o and F_1 satisfy (6) ; let G_α be the maximal

Card 2/3

scale for F_0, F_1 ; let E_α be an arbitrary scale on $[0,1]$ which satisfies (8). Let the linear operator A be defined on F_1 and let it satisfy the condition

$$\|Ax\|_{E_0} \leqslant C_0 \|x\|_{F_0}, \quad \|Ax\|_{E_1} \leqslant C_1 \|x\|_{F_1} \quad (x \in F_1)$$

Then for $0 \leqslant \alpha \leqslant 1$ it holds :

$$(9) \qquad \|Ax\|_{E_\alpha} \leqslant C_0^{1-\alpha} C_1^{\alpha} \|x\|_{G_\alpha} \quad (x \in F_1) .$$

Some further similar results are given. There are 4 theorems. There are 2 references : 1 Soviet and 1 American.

PRESENTED: January 28, 1960, by N.N. Bogolyubov, Academician
SUBMITTED: January 27, 1960

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

Kreyn, S.G.

81856

S/020/60/133/02/07/068
C111/C222

16.4600

AUTHOR: Kreyn, S.G., and Prozorovskaya, O.I.

TITLE: Analytic Semigroups and Incorrect Problems for Evolutionary Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 133, No. 2, pp. 277-280

TEXT: Let A be a closed unbounded operator which is the generating operator of a strongly continuous semigroup of bounded operators U(t) in the Banach space E. As the solution of

(1) $$\frac{dx}{dt} = -Ax$$

on $[0,T]$ the authors denote a function x(t) which is continuous with respect to the norm of E, which on $[0,T]$ has a strong derivative and which satisfies (1). The problem (1),

(2) $$x(0) = x_0$$

is called correct in the class of bounded solutions on $[0,T]$ if to all $M, \varepsilon, \tau \in (0,T)$ there exists a $\delta(M, \varepsilon, \tau)$ so that from

Card 1/4

Analytic Semigroups and Incorrect Problems for Evolutionary Equations

81856
S/020/60/133/02/07/068
C111/C222

(3) $\|x(t)\| \leqslant M$, $t \in [0,T]$, $\|x(0)\| \leqslant \delta$

there follows

(4) $$\|x(\tau)\| \leq \varepsilon \quad .$$

According to the formula $y(t) = x(T - t)$ every solution $x(t)$ of (1) - (2) generates a solution of

(5) $$\frac{dy}{dt} = Ay \quad , \quad y(0) = x(T) \; .$$

In order to prove the correctness of (1) - (2) the authors estimate the solutions $y(t) = U(t)y_0$ of (5) by their values for $t = T$ and by the maximum of their norm on $[0,T]$.

Theorem 1 : Let $U(t)$ be a strongly continuous semigroup of bounded operators which admits an analytic continuation in a certain conic semimodulus K of the z-plane. Let $\overline{G}$ lie in K. Let $N = \max_{z \in \overline{G}} \|U(z)\|$. Then for all $z_0, z_1 \in G$

Card 2/4

and $y \in E$ it holds

(6) $$\|U(z_1)y\| \leq N^{1-\omega} C^{\omega} \|U(z_0)y\|^{\omega} \|y\|^{1-\omega},$$

where $C(z_0)$ and $\omega(z_0, z_1)$ are non-negative and do not depend on y in E.

Theorem 2 : Let A be a generating operator of a semigroup of bounded operators which is strongly continuous on $[0,\infty]$ and which is analytic on a certain conic semimodulus. Then (1) - (2) is correct in the class of bounded solutions on every $[0,T]$.

The theorems 3 and 4 give estimations for $\|U(t)y\|$ and $\|y(t)\|$ under more special assumptions. Herefrom it follows

Theorem 5 : Let Ω be a bounded domain of the n-dimensional space with a sufficiently smooth boundary Γ. Let L be a strongly elliptic differential expression of 2m-th order with sufficiently smooth coefficients. The problem

(12) $$\frac{\partial u}{\partial t} = -Lu ,$$

Analytic Semigroups and Incorrect Problems for Evolutionary Equations

81856
S/020/60/133/02/07/068
C111/C222

(13) $$u|_{\Gamma} = \left|\frac{\partial u}{\partial n}\right|_{\Gamma} = \dots = \frac{\partial^{m-1} u}{\partial n^{m-1}}\Big|_{\Gamma} = 0$$

is correct on $[0,T]$ $(T>0)$ in the class of solutions bounded in Lp $(p>1)$.
Theorem 6 is a conclusion from theorem 4.
The author mentions P.Ye. Sobolevskiy and M.Z. Solomyak.
There are 9 references : 7 Soviet, 1 English and 1 French.

ASSOCIATION: Voronezhskiy lesotekhnicheskiy institut (Voronezh Forest Technical Institute)

PRESENTED: March 21, 1960, by I.G. Petrovskiy, Academician

SUBMITTED: March 18, 1960

X

Card 4/4

S/763/61/000/000/008/013

AUTHOR: Kreyn, S. G.

TITLE: Incorrect problems and evaluation of the solutions of parabolic equations.

SOURCE: Nekotoryye problemy matematiki i mekhaniki. Novosibirsk, Izd-vo Sib. otd. AN SSSR, 1961, 84-86.

TEXT: The present brief communication deals with a number of problems (investigated with Aspirant O. I. Prazorovska) related with the incorrect problems for equations of the type of the equation of the reverse heat conductivity, $\partial u / \partial t = - \Delta u$. The study of these problems is performed with the aid of the theory of the functions of a complex variable and the theory of analytical half-groups of bounded operators in a Banach space. As a matter of general principle it is found that once the correctness of a problem in one direction (with respect to t) and its analyticity are established, there follows the correctness in the reverse direction in a class of bounded solutions. Examples are set forth. At the present time the author and his associate are studying the problem of the correctness of reverse problems for certain classes of parabolic equations with nonlinearities.

Card 1/1

KREYN, S.G.; SEMENOV, Ye.M.

A space scale. Dokl.AN SSSR 138 no.4:763-766 Je '61.
(MIRA 14:5)

1. Voronezhskiy lesotekhnicheskiy institut. Predstavleno akademikom M.A.Davrent'yevym.
(Spaces, Generalized) (Functional analysis)

KREYN, S.G.; PETUNIN, Yu.I.

Criterion of the affinity of two Banach spaces. Dokl. AN SSSR 139 no.6:1295-1298 Ag '61. (MIRA 14:8)

1. Voronezhskiy gosudarstvennyy universitet. Predstavleno akademikom A.N.Kolmogorovym.
(Banach spaces)

41331

16.4500

S/020/62/146/003/002/019
B172/B186

AUTHORS: Kreyn, S. G., Laptev, G. I.

TITLE: Boundary value problems for an equation in a Hilbert space

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 146, no. 3, 1962, 535-538.

TEXT: The differential equation

$$d^2u/dt^2 - Au + \lambda B(t)u = 0$$

with the boundary conditions

$$\alpha_{11}u(0) + \alpha_{12}u'(0) + \beta_{11}u(T) + \beta_{12}u'(T) = 0$$
$$\alpha_{21}u(0) + \alpha_{22}u'(0) + \beta_{21}u(T) + \beta_{22}u'(T) = 0$$

is considered for $0 \leq t \leq T$, where the values of the desired function $u(t)$ are elements of a Hilbert space H whilst A and B are self-adjoint, positive definite operators in H. A^{-1} is required to be completely continuous, and B bounded with sufficiently smooth dependence on t; λ is a parameter. The differential equation, together with the boundary conditions,

Card 1/3

are reduced to the integral equation

$$y(t) = \lambda \int_0^T B^{1/2}(t)R(t,\tau)B^{1/2}(\tau)y(\tau)d\tau$$

where $y(t) = B^{1/2}(t)u(t)$, and $R(t,\tau)$ is a function of the operator A. Thereupon the following theorem is proved: if the boundary conditions are self-adjoint and λ is no eigenvalue, then the boundary value problem under consideration can be reduced to the eigenvalue problem of a completely continuous self-adjoint operator in the Hilbert space $L_2(H, [0,T])$. This theorem is applied to the problem

$$\frac{\partial^2 u}{\partial x_1^2} + \dots + \frac{\partial^2 u}{\partial x_n^2} + \omega^2/c^2(x_1,\dots,x_n)u = 0$$

$$u(T,x_2,\dots,x_n) = \varrho u(0,x_2,\dots,x_n),$$

$$u'_{x_1}(T,x_2,\dots,x_n) = \varrho u'_{x_1}(0,x_2,\dots,x_n)$$

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R00082642O(

Boundary value problems for an... S/020/62/146/003/002/019
B172/B186

which occurs in the theory of cylindrical waveguides. Hence it follows that if this problem has a solution for a definite ϱ at a real λ, then it also has a solution for $1/\bar{\varrho}$ at the same λ. Up to now this statement has been only hypothetical.

ASSOCIATION: Voronezhskiy gosudarstvennyy universitet (Voronezh State University)

PRESENTED: April 13, 1962, by I. G. Petrovskiy, Academician

SUBMITTED: April 9, 1962

Card 3/3

KREYN, Selim Grigor'yevich; USHAKOVA, Valentina Nikolayevna; KOPYLOVA, A.N., red.; AKSEL'ROD, I.Sh., tekhn. red.

[Mathematical analysis of elementary functions] Matematicheskii analiz elementarnykh funktsii. Moskva, Fizmatgiz, 1963. 168 p. (MIRA 16:4)
(Mathematical analysis) (Functions)

45114

S/208/63/003/001/006/013
B112/B102

AUTHORS: Kreyn, S. G., Prozorovskaya, O. I. (Voronezh)

TITLE: Approximation methods for solving inexact problems

PERIODICAL: Zhurnal vychislitel'noy matematiki i matematicheskoy fiziki, v. 3, no. 1, 1963, 120-130

TEXT: The equation

$$dv/dt = Av \quad (0 \leqslant t \leqslant T) \tag{1.1}$$

with a self-adjoint operator A and the corresponding difference system

$$(u_k^N - u_{k-1}^N)/\Delta t = Au_{k-1}^N, \tag{1.3}$$

where

$$\Delta t = T/N \text{ and } u_k^N = u^N(k\Delta t),$$

are considered in a Hilbert space H. The following theorems are derived: (1) The solutions of (1.3) with the initial conditions $u_o^N = v_o$ converge

Card 1/2

uniformly towards uniformly bounded solutions of (1.1). (2) The uniformly bounded solutions of the equations

$$(u_k^N - u_{k-1}^N)/\Delta t = A_N u_{k-1}^N, \tag{2.1}$$

where

$$A_N u \to Au \quad (u \in D(A)), \tag{2.2}$$

converge uniformly towards a solution $v(t)$ of (1.1) if $u_o^N \to v(0)$ for $N \to \infty$. (3) The uniformly bounded solutions $v_n(t)$ of the system

$$dv_n/dt = A_n v_n, \quad v_n(0) = v_n^o, \tag{3.1),(3.2}$$

where

$$A_n u \to Au \quad (u \in D(A)), \tag{3.3}$$

converge uniformly towards a solution $v(t)$ of (1.1)

SUBMITTED: February 17, 1962

Card 2/2

APPROVED FOR RELEASE: Monday, July 31, 2000 CIA-RDP86-00513R000826420(

KREYN, S.G.

"Mathematical problems of the dynamics of a viscous incompressible liquid" by O.A.Ladyzhenskaia. Reviewed by S.G.Krein. Usp. mat. nauk 18 no.2:251-253 Mr-Ap '63. (MIRA 16:8)
(Hydrodynamics) (Ladyzhenskaia, O.A.)

BEREZANSKIY, Yu.M.; KREYN, S.G.; ROYTBERG, Ya.A.

Theorem on homeomorphisms and a local increase in smoothness up to the boundary of solutions to elliptic equations. Dokl. AN SSSR 148 no.4:745-748 F '63. (MIRA 16:4)

1. Institut matematiki AN UkrSSR, Voronezhskiy gosudarstvennyy universitet i Stanislavskiy pedagogicheskiy institut Predstavleno akademikom I.G.Petrovskim.

(Hilbert space) (Differential equations)

L 32469-65 EWT(d) IJP(c)
ACCESSION NR: AR4046311 S/0044/64/000/008/B061/B062

SOURCE: Ref. zh. Matematika, Abs. 8E316

AUTHOR: Berezanskiy, Yu. M.; Kreyn, S. G.; Roytberg, Ya. A.

TITLE: The theorem on homeomorphisms and the local increase of smoothness, down to the boundary of solutions of elliptic equations

CITED SOURCE: Materialy* k Sovmestnomu sovetsko-amerikanskomu simpoziumu po uravneniyam s chastny*mi proizvodny*mi. Novosibirsk, avg. 1963. Sib. otd. AN SSSR. Novosibirsk, 1963.

TOPIC TAGS: homeomorphism, smoothness, elliptic equation, Euclidian space, manifold, conjugate operator, finite dimensional space, interpolation theorem, Hilbert scale, discontinuous coefficient

TRANSLATION: Let $\Omega \subset R^n$ be a limited region in the Euclidian space with the boundary $\partial\Omega$. Within Ω, the operator

Card 1/4

L 32469-65
ACCESSION NR: AR4046311

$$A(x, D) = \sum_{|\alpha| \leq 2m} a_\alpha(x) D^\alpha .$$

is given. On the manifold $\partial\Omega$ the following operators are determined,

$$B_j(x, D) = \sum_{|\alpha| \leq m_j} b_{j\alpha}(x) D^\alpha, j = 1, \ldots, m,$$

$a = (a_1, \ldots, a_n)$ is the multiindex, $|\alpha| = \alpha_1 + \ldots + \alpha_n$. The functions $a_\alpha(x)$, $b_{j\alpha}(x)$ are assumed to be sufficiently smooth. It is well known (RZHMat, 1961, 8B180) that the properly elliptic operator $\mathfrak{A} = (A_1 \ B_1, \ldots, B_m)$ in all cases where $l \geq l_0 = \max(2m, m_j + 1/2)$ realizes (with an accuracy to finite-dimensional spaces) the homeomorphism

$$\mathfrak{A}: H^l(\Omega) \to H^{l-2m}(\Omega) \times \prod_j H^{l-m_j-\frac{1}{2}}(\partial\Omega).$$

If, for operator $\mathfrak{A}$, there exists a conjugate operator of the same type, then it may be concluded from considerations of duality that the conjugate operator $\mathfrak{A}^*$

Card 2/4

L 32469-65
ACCESSION NR: AR4046311

$$\mathfrak{A}^{*}: H^{-l+m}(\Omega) \times \prod_{j} H^{-l+m_j+\frac{1}{2}}(\partial\Omega) \to H^{-l}(\Omega)$$

determines the homeomorphism (also with an accuracy to finite-dimensional spaces).. In addition, the following theorem on increased smoothness is correct: if the solution of the equation

$$Au = f(x) \quad (x \in \Omega),$$
$$B_j u = \varphi_j(x) \quad (x \in \partial\Omega)$$

a priori pertains to $H^s(\Omega) s \geq l_0$, and $f(x) \in H^{l-2m}(\Omega)$, $\varphi_j \in H^{l-m_j-1/2}(\partial\Omega)$, then for $l' > s$, the solution actually pertains to the space $H^l(\Omega)$ and the corresponding apriori estimate is true. The paper presents theorems on homeomorphism for the intermediate spaces H^k and normal homogeneous boundary conditions. These theorems are applied to local increase of smoothness of the solution down to the boundary. The proof rests on the interpolation theorem which consists in the following: if H^t and $H^{t'}$ are 2 Hilbert scales of space and the operator B operates

Card 3/4